The BULLETIN

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JUNE, 1918

HYDRO ELECTRIC
POWER COMMISSION
OF ONTARIO

The BULLETIN

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CONTENTS

REGULAR DEPARTMENTS

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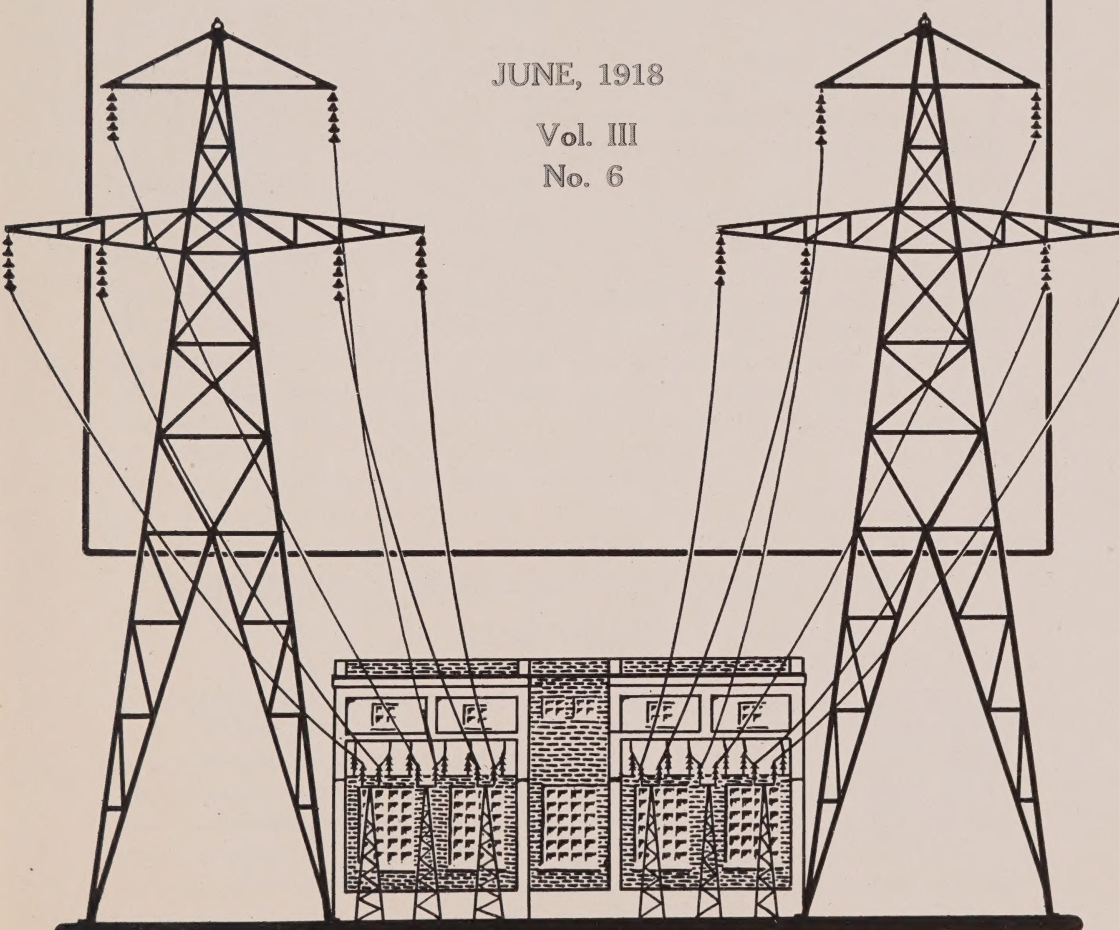


EDITORIAL

Industrial Uses of Hydro Power

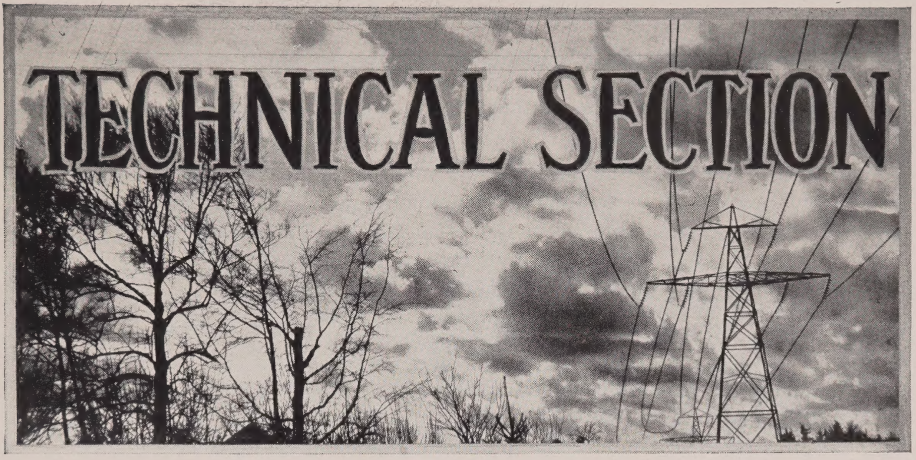
IN CONTINUANCE of our policy of presenting typical applications of Hydro power to the various industries of Ontario, we are this month publishing "Hydro Power in the Leather Industry," a very interesting and instructive article by F. R. Mosbaugh of the Anglo-Canadian Leather Company, Huntsville.

The writer in entertaining fashion, takes one through all the various stages in the production of leather, from the natural hide to the finished product. This article clearly illustrates the superiority of electric power in leather making.

There are numerous other interesting applications of Hydro power which we should like to present to our readers and in furtherance of this aim, we should like to enlist the active support of the municipal superintendants and managers. If there is an unusual or interesting industry using Hydro power in your town, write us about it, and if possible, endeavor to get someone in the concern to supply us with some good illustrations. Of course lack of space does not permit us at this time to use an article on any industry which has been previously described in THE BULLETIN.

Association of Municipal Electrical Engineers

THE first regular meeting of this Association will be held at Niagara Falls, on June 14th and 15th. The program, which we are publishing in this issue, is a varied one, and is well calculated to stimulate the interest of all delegates. The trip to the Chippewa Development presents a good opportunity of examining the initial work on what will be the biggest power development in the world.



Municipal Waterworks--Palmerston

By A. E. DAVISON

ORIGINALLY, the town of Palmerston obtained its water supply by means of air lift pumping from two 8 inch wells, but the quantity thus raised became inadequate to serve the growing needs and during the first half of 1916, the local authorities consulted the Commission on the subject of increasing the supply.

Several schemes were thought of, the two chief ones being as follows:

1. To install a deep well pump.
2. To install a centrifugal pump.

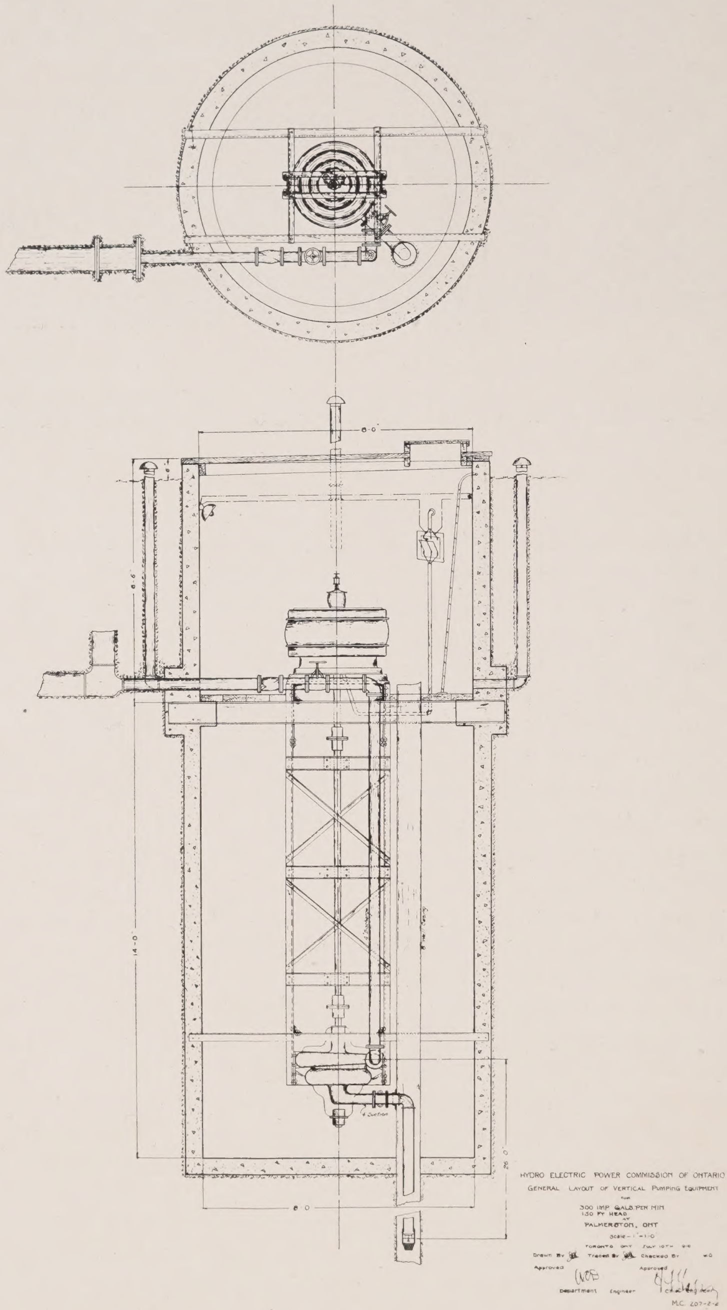
The first was abandoned since it was found that in order to obtain the 300 or 400 Imp. g.p.m. required, a 12 inch well would be necessary, this meant boring a new well, which it was desired to avoid.

The second presented the difficulty that careful estimates based on the data at hand showed that the water level, when the required quantity of water was being pumped, would be about 40 feet below the surface of the ground and as a centrifugal pump does not work satisfactorily with more than about 18 feet of suction the use of such a pump would involve the sinking of a caisson, around the well, large enough to accommodate the pump and motor.

It appeared, however, that this scheme might be feasible although it was realized that trouble would be encountered owing to the presence of quicksand some distance below ground level.

Finally a recommendation was made to the local authorities that a caisson around one of the wells be sunk about 30 feet deep and 8 feet in diameter and that in it should be suspended a vertical pump and motor, the pump to be at the bottom of the caisson and the motor near the top (see illustration).

The local Water & Light Commission having given the Hydro-Electric Power Commission authority to proceed on this basis, plans



General layout of the Palmerston pumping equipment

and specifications covering the requirements were issued and tenders were obtained; the contract for the pump and motor going to the Canadian Fairbanks-Morse Company, Limited. The pumping equipment comprised the following:

(a) One 4-inch, 2-stage, vertical centrifugal pump, capable of delivering 400 Imp. g.p.m. of clean, fresh water against a total head of 125 feet with a guaranteed efficiency of 55 per cent. the speed being 1435 r.p m.

(b) One 30 h.p., 3-phase, 25-cycle, 550-volt, vertical, squirrel cage, moisture proof, induction motor, having a guaranteed efficiency of 87 per cent. at full load.

(c) Also, vertical steel framework, steady bearings, ball-thrust bearings, etc.

The work of excavating and making the caisson was undertaken by the Town with the advice of the Commission, a wood lining at first being tried; owing, however, to difficulties due to quicksand and the presence of some large boulders, as the work proceeded downwards, the Commission's engineers recommended a steel caisson, specifications for which were issued. This steel caisson was purchased from the National Equipment Company of Toronto and as soon as it was received the work was continued to a successful conclusion, though not without further difficulties due to quicksand being met.

The pump and motor having passed the tests at the maker's works, were shortly afterwards installed and started up. A few minor troubles were experienced at that stage but were very soon set right and the equipment has now been operating quite satisfactorily since the first two or three weeks after installation—a period of some twelve months.

A small housing has been built over the caisson and electric lamps illuminate the interior. In order to instal this equipment, the air lift pumping plant at one of the wells has of course been dismantled, but the other remains intact for use in emergencies.

A very slight seepage of water into the caisson takes place and to deal with this a small gear pump has been installed but it is only operated infrequently.

The entire cost of the work, including the surmounting of the troubles experienced with the quicksand, as mentioned above, was approximately $3,400.

As showing the financial advantage of having carried out this work, it may be said that information received from Palmerston indicates that whereas formerly the cost of coal for pumping was some 720 tons per annum at $4.45 per ton ($3,204) the cost for electric current is now about $876. plus 12 tons of coal at $10.50 (N.B.—This price for coal seems high but does not seriously affect the saving of $2,200. shown if reduced to the figure used below, viz., $7.) which represents a saving of $2,200. per annum in operation alone. It may safely be added that there is no increase in any other costs, such as labor or repairs, tending to off-set this favorable result.

The saving, as above, does not represent the true state of affairs for 1917, since, had the old method of pumping been in use, the gain would have been about as follows:

720 tons of coal at $7. per ton = $5,040., while for electricity, assuming coal at the same price (viz., $7. per ton) the cost would be $876. plus $84. = $960., shewing a saving of over $4,000. for the year.

The accompanying illustration, while not representing accurately the correct details of the Palmerston equipment, shews plainly the general plan on which the work has been carried out.

Peak Load Control

By S. L. B. LINES

THE peak load and its effect on the distribution system, has perhaps been given more consideration by Station Engineers than any other problem with which they have had to deal, with the result that its effect on the commercial success of the undertaking is very fully realized. The adoption of a number of different methods of charging, each suited more or less to specific local conditions, has been the result. Amongst these methods may be mentioned:

1. Ampere Maximum Demand.
2. A Two Rate principle.
3. A Restricted Hour Use.
4. Flat charge for a definite h.p. with a meter reading in kw. hr., all current consumed in excess of the definite h.p.
5. Kilowatt Hours Maximum Demand.
   (a) Based on the horse power installed.
   (b) Based on the Maximum Demand Meter.
   (c) Based on the Graphic Meter.

Of these, B and C are becoming more and more universal for large customers and would appear to be essentially fair to both the customer and the supply authority, provided that, it is understood by the customer. Unfortunately this is not always the case, and its effect on the customer is easily illustrated by an actual example. Presume that the normal requirements of the customer called for 100 h.p. In Stratford the service charge as shown by a Maximum Demand Meter is $1.00 per h.p. per month.

The first 50 hours use at 2.6
The second 50 hours use at 1.8
The balance at........... 0.15

Assuming that the customer runs 24 hours per day on the unrestricted basis, his bill would be subject to a discount of 10 per cent. cash, and would read as in Table A.

Table A

Service Charge, 100 h.p.			$100.00
First 50 hrs. use 75 kw. x 50 =	3750 kw. hr. at 2.6		97.50
Second 50 hrs. use	3750 kw. hr. at 1.8		67.50
Balance, 150 hrs. =	8250 kw. hr. at .15		12.40
Meter total reads	15750 kw. hr.		277.40
	Cash discount		27.74
	Net Bill		$249.66

Table B

Service Charge		$125.00
Consumption Charge—		
First 50 hrs. use 93.7 kw. x 50 =	4680 kw. hr. at 2.6	122.00
Second 50 hrs. use 93.7 kw. x 50 =	4680 kw. hr. at 1.8	84.50
Balance	6390 kw. hr. at .15	9.58
	Total	341.08
	Cash discount	34.10
	Net Bill	$ 306.98

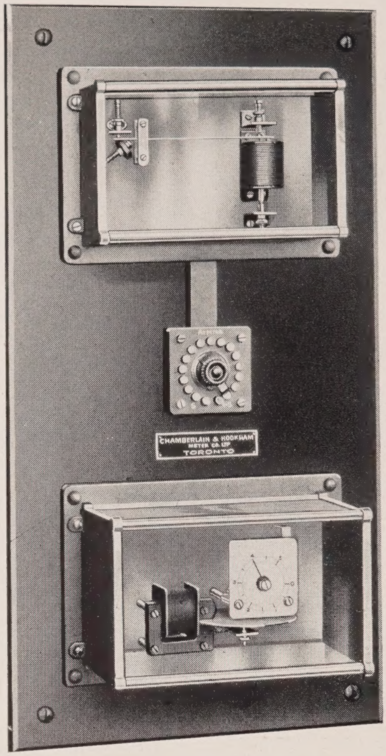
For a load of less than 100 h.p. the peak is taken at one minute. Therefore if once during a month, due to carelessness or ignorance, the load is permitted to rise to 125 h.p. for one minute the bill would read as in Table B, showing that the customer would pay $57.32 more in the second instance than he would in the first for exactly the same kilowatt hours consumption, in spite of the fact that the output in his factory would probably not be increased at all.

To assist the customer to control this situation, an instrument has recently been placed on the market which give the customer the necessary warning. This instrument is shown on page 140. It consists of a current element rheostat for control of the current element, time lagging element, bell ringing transformer and bell. The current element is built with a standard of 5 amp. winding for use with the transformer. It is capable of adjustment to the required load by means of the steps of the rheostat, anywhere from 1.5 to 5 amp.

The time element has a range in the instrument shown, from 0 to 5 minutes. The time range can, however, be arranged for any particular requirements by a slight change in the gearing. The method of operation is as follows:

The current element is set to the maximum load required during the month and the time element slightly under the maximum permitted by the power contract for the above amount of power. When the current rises to or above the set maximum,

the current element immediately operates, throwing the current on to the time element. This element then runs until the time setting is reached, when the bell rings out a warning that the load is excessive. The construction of the instrument is such that it is only necessary to reduce the current 3 per cent. below the pre-determined load, for the bell to cease ringing and re-set the time element. Platinum points are used throughout and the instrument, if anything, is on the side of solid construction. This instrument was designed and manufactured by the Chamberlain & Hookham Meter Company Limited, of Toronto.



A New Variety of Line Trouble

By A. T. HICKS
Local Manager, H.E.P.C. of Ont., Oshawa

ALL those who are familiar with the operation of transmission and distribution lines have seen or heard of numerous cases where interruptions have resulted from short-circuits or grounds caused by birds or animals coming into contact with the lines, but it is rather a novelty for derangement of service to result from the depradations of a Curtis biplane—in this peaceful country, at any rate. Such a case occurred at Oshawa on April 22nd and as the circumstances were so unusual they may be worth recording in THE BULLETIN.

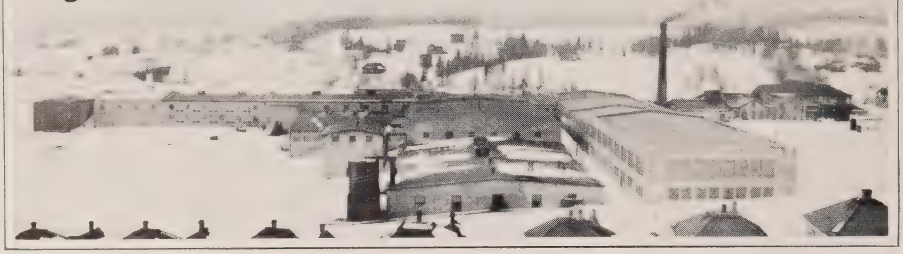
An aviator flew from the aviation camp at Leaside to Oshawa, arriving at the latter place at 5.45 p.m. For some minutes he entertained those who were on the streets with an interesting exhibition of plain and fancy flying, including "looping the loop," "figure eights" and circling

church spires, water tanks and other elevated objects. All went well until Nemesis overtook him in the form of a stalled engine. The unfortunate pilot, finding his machine out of control, endeavored to land in a street but was unable to accomplish this, and then attempted to alight on the roof of the Dominion Bank building, immediately adjacent to the intersection of King and Simcoe streets—the business centre of the town. The result is clearly shown in the accompanying illustration. The Commission's feeders which run parallel to the face of the building supported most of the weight of the plane and this probably saved the life of the pilot and the spectators on King street.

A number of bricks were knocked from the cornice of the building and injured a woman who was passing at the time but no other casualties resulted. The pilot was able to climb to the roof of the building and thence made his escape to the ground. The primary, street lighting and secondary wires were badly tangled, of course, and the circuit breakers at the sub-station opened promptly. One of the feeders involved in the accident was the 4,000-volt primary which supplies Whitby.

Two views of the airplane accident at Oshawa

Hydro Power in the Leather Industry



By F. R. MOSBAUGH
Anglo-Canadian Leather Co., Huntsville, Ont.

MANY years ago, when old St. Crispin remarked that, "There is nothing like leather," his statement was probably based on leather obtained by unhairing the hides in wood ashes, after which they were thrown into tubs or vats containing water and bruised bark, where they remained from three to five years. This leather was then hand hammered, and from all accounts, if put on the market to-day, would not even get by a government army-boot inspector. Another pleasing little custom of these ancient times was to keep the tanner and his tubs outside the city limits.

Things have changed since then, and were this philosophical old Saint to arrive in Huntsville some morning, he would be greatly surprised to find, a short distance from the station, a modern plant of concrete and steel construction, well designed and of pleasing appearance. Upon inquiry he would learn that this was the Anglo-Canadian Leather Company's oak sole leather tannery, the largest of its kind in the British Empire.

Naturally, having at one time been interested in leather, he would desire to inspect the interior of this well appointed tannery, and his visit would begin with the large hide-house, wherein, from time to time, are stored hides from the United States, Canada, Mexico, South and Central America, Africa, China, India, Madagascar—in fact from the world's markets. These hides are taken from storage and soaked in vats of cool water, pumped from deep wells by motor-driven pumps, after which they are softened in powerful hide mills or "kickers," which bring the hides to the natural state in which they existed on the animal's back. After this they are pinned or toggled together and in this manner are reeled by a traveling electric reel into concrete vats of lime water of increasing strength until the hair is sufficiently loosened to permit its being taken off with a machine expressly designed for this purpose. The hair is collected,

1. Machine for oiling leather. 2. Direct-connected brass centrifugal pumps for pumping tannin liquor. 3. Revolving drums in which the finishing process of tanning is accomplished. 4. Electric travelling reels over which hides are reeled into lime vats. 5. Electrolytic steam boiler. 6. Electrically driven air compressor. 7. Automatic bleach for bleaching tanned leather. 8. Electrically driven fan for drying leather. 9. Rolling machines, where leather is firmed and polished. 10. Machine for removing hair from hides. 11. Large leaches in which the tannin is extracted from ground bark.

thoroughly washed, mechanically dried, baled, and is used in the plaster, felt, and mattress industries.

Following the depilatory process, the hides are washed in large revolving drums or wheels, and then passed through a fleshing machine, which makes the hides of uniform thickness and removes the flesh. This flesh is lined and used in the manufacture of glue. Small edgings or hair that might remain on the hides are trimmed off over beams, and then the hides are hung over sticks in a weak organic acid to neutralize any interior lime present. This solution is constantly plunged by compressed air. Compressed air is also used for unloading tank cars and pumping oils and liquids from steel storage tanks into the plant.

Succeeding the deliming treatment, the hides are hung upon rockers in a solution of weak tannin made from bark, where they are gently rocked for about two weeks, after which they are laid for a period into vats containing tannin liquor of greater density, and then the tanning is finished in concentrated liquor in revolving drums. The process throughout is under chemical supervision and is controlled from the laboratory. The tannin used in this process is obtained from bark, which is ground into thin shavings, conveyed into large leaches, and extracted with boiling water. In conjunction with bark there is used, Oak Extract from the Southern States, Quebracho from South America, Cutch in its native mat bags from Borneo, Wattles from Africa, Divi divi from Mexico, Myrobalans from India, Sumac from Italy, and many other tanning materials.

After the leather has been completely tanned, it is slightly bleached, oiled with cod oil, and hung in large lofts where it is dried by motor-driven fans. The dry leather is taken to high pressure rolling machines which firm and polish it, after which it is sorted and shipped to the distributing warehouses where it is cut into soles or delivered to the shoe manufacturers in sides.

The tannery throughout is operated by Hydro-Electric power, accomplishing in almost as many weeks, as required years in old St. Crispin's time. The power requirements in leather making are characterized by a low commercial load-factor. The true, or running load-factor, however, is quite high, and therefore it is possible, by proper arrangements of individual and group motor drive, to secure good operating efficiency and high power factor. A 250 kva. synchronous motor is used to further improve power factor conditions. The large diversity factor, together with the present high cost of fuel offsets, to a very large degree, the value that would exist in the use of exhaust steam for heating purposes. This condition, together with the actual saving in energy in the elimination of line-shafting makes electric service very successful in the leather industry.

The arrangement of drives has been worked out with a view to reducing power lost in transmission to a minimum, and, at the same time grouping certain machines so that the first cost of electrical

equipment might be kept within limits comparing very favorably with mechanical drive.

The following table shows the general arrangement of motor drive:

Machine	Description	H.P.	Motor Type	Speed
Bark Grinder	Belt driven through friction clutch	100	Synchronous	600
1000 gal. Centrifugal Pump	Single stage 85 lb. head direct connected to	100	Induction	1800
Hide Mills	Four mills driven in groups of two through line shaft by	55	"	900
Tanning Drums	Group drive with 16 to 24 drums per motor each drum controlled by friction clutch	100	"	600
Leather Rolling	Five groups of four machines each driven by	15	"	900
Leather Setting Out	Group of four machines driven by	20	"	1200
Hide Unhairing	Two machines individually driven by	10	"	900
Hide Fleshing	Two machines driven by	20	"	1200
Hair Washing and Drying	Belt driven by	5	"	1800
Hide Washing	Four drums belt drive	20	"	900
Hide Reeling	Four traveling reels each direct connected to	2	"	1200
Air Compressor	Belt driven by	10	"	1800
Centrifugal Tanning Pump	Direct connected to	5	"	1800
Rocker Vats	98 Racks driven 7 strokes per min. through worm gear reduction	5	"	1800
90 ft. Well	Belt driven through pump jack	5	"	1200
Carpenter Shop	Belt driven	10	"	1800
Blacksmith Shop	Belt driven forge and emery stand	2	"	1800
Machine Shop	Belt driven lathes	5	"	1200
Pipe Threading Machine	Individually driven	2	"	1200
Air Circulating Fans	Individually driven	5	"	1200

A very ingenious device for improving the load factor has been designed by members of the staff and built in the shops of the Company. This (see Fig. 5) is an electrolytic type electric steam boiler, which has been constructed from an old engine cylinder and discarded fittings. Three equally spaced angle-irons are set upright on insulated supports and supplied with 3-phase, 500 volts, by three leads passing through specially prepared, hard rubber bushings at the top of the boiler. A small amount of soda solution is used to increase the conductivity of the water to the desired point. The generated steam is fed into the low-pressure steam lines leading from the main boilers. The load taken is easily regulated by varying the amount of water in the boiler. The apparatus consumes approximately 100 kw. under normal working conditions.

In connection with the tannery are the electrical, machine, carpenter, blacksmith, brass foundry, and oxy-acetylene welding departments. Most of the machines are driven with separate motors. The pumping of water and tannin liquor is done with rotary pumps, and the conveyors are also motor driven.

Sanitary lavatories and shower baths, as well as first aid, are at the employee's disposal, and the Company's houses are equipped with

baths, furnaces, electric lights, and some have electric ranges and heaters. A comfortable club-room is maintained for after working hours, and a band of about sixty members, comprising some of America's most talented musicians frequently gives outdoor concerts.

In all, the making of leather requires the assistance of many other industries and involves mankind the world over.

Association of Municipal Electrical Engineers

THE time is now close at hand when the Association of Municipal Electrical Engineers will hold its first regular meeting. This is to be at Niagara Falls on June 14th and 15th. These two days will be spent by the delegates in following this general programme:

Friday, June 14th, a.m.—Registration and party visits to power plants. P.M.—Business meeting and papers, with discussion. Evening—Association supper.

Saturday, June 15, A.M.—Papers with discussion. P.M.—Tour of the Chippewa Development.

At the business meeting the following notices of motion to amend the Constitution and By-laws, will be dealt with:

1. To change the first clause under Privileges, by inserting after the word "rights", the words "at general meetings".

2. To creat a Commercial Membership to include manufacturers, contractors and dealers having direct contact with member municipalities. Commercial Memberships are to have no voting rights or rights to hold office. The membership fee for Commercial Membership shall be $25.00 per annum.

3. To make the railway expenses of the members of the Executive Committee payable by the Association, when attending Executive Committee meetings.

4. To provide for five District Vice-Presidents as follows:

Niagara District,
Central District,
Georgian Bay District,
Northern District,
Eastern District.

Papers and addresses will include the following:

"Synchronous Motors" illustrated —By M. J. McHenry, Manager, Walkerville Hydro-Electric System.

"Factory Lighting" illustrated —By H. H. Madgsick, of the Engineering Department, National Lamp Works of General Electric Company Cleveland, Ohio.

"Thirty Years as an Electrical Salesman"—By George Rough, General Manager, Packard Electric Company, St. Catharines.

"Sales Service"—By J. F. S. Madden, Sales Engineer, Hydro-Electric Power Commission of Ontario, Toronto.

"The Evolution of Electrical Inspection in Ontario"—By H. F. Strickland, Chief Electrical Inspector, Hydro-Electric Power Commission of Ontario, Toronto.

"Overseas Trade"—By Fred. W. Field, H.M. Trade Commissioner, Toronto Department of Overseas Trade.

Brief Sketch of the Chippewa Creek Development—By T. H. Hogg, Assistant Hydraulic Engineer, Hydro-Electric Power Commission of Ontario, Toronto.

Arrangements are being made to transport the delegates over the site of the Chippewa Development by means of automobiles and motor trucks. There will be ample facilities for all seeing this work at the beginning, both at the Chippewa Creek end and also at Queenston.

Every effort is being made to make this meeting a success and we trust that the municipalities will do all within their power to assist.

Delegates are reminded that if they should wish to visit the American side, it will be necessary for them to be provided with passports as the provisions of restricting crossing the border, are very rigid.

Since this is the first meeting of the Association, no arrangements have been made for the entertainment of ladies accompanying the delegates. Delegates may, if they desire, bring their wives. There will no doubt be much, outside of the meetings of the Association, that will be of general interest to them.

Each Municipality has received a letter from E. J. Stapleton, Chairman of the Entertainment Committee, advising them of this meeting, and requesting that the post card accompanying that letter, be filled in and returned. It is very important that those post cards be returned as soon as possible, for this is the only means the executive will have of ascertaining the probable attendance, and thereby arranging for adequate accommodation.

Any inquiries in reference to the arrangements of the meeting, should be addressed to either E. J. Stapleton, Collingwood, Chairman of the Entertainment Committee, or to S. R. A. Clement, 190 University Ave., Toronto, Secretary of the Association.

Collingwood

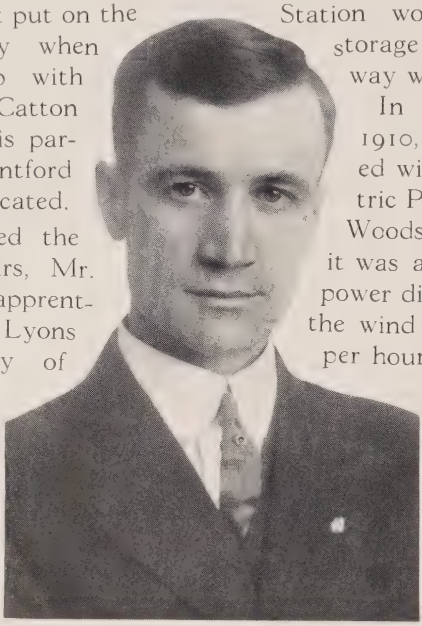
The Water & Light Commission has closed up a number of power contracts during the last couple of months, including two contracts for farmers a couple of miles outside the municipality. They have also closed up a contract with the Collingwood Shipbuilding Company for a further supply of 800 h.p. This power will be used to operate two direct-connected motor driven compressors. The contract for the compressors and motors has been awarded to a firm in England, and the local Commission has applied to the Hydro-Electric Power Commission for increased transformer capacity in the sub-station to take care of this extra load.

Who's Who in Hydro?

MR. CATTON was born in Burford in the year 1886. Burford is just nine miles from Brantford, where he is now situated. Mr. Catton's ancestors came to Burford before Brantford was on the map, yet Burford was not put on the map until recently when they connected up with Hydro. When Mr. Catton was quite young his parents moved to Brantford where he was educated.

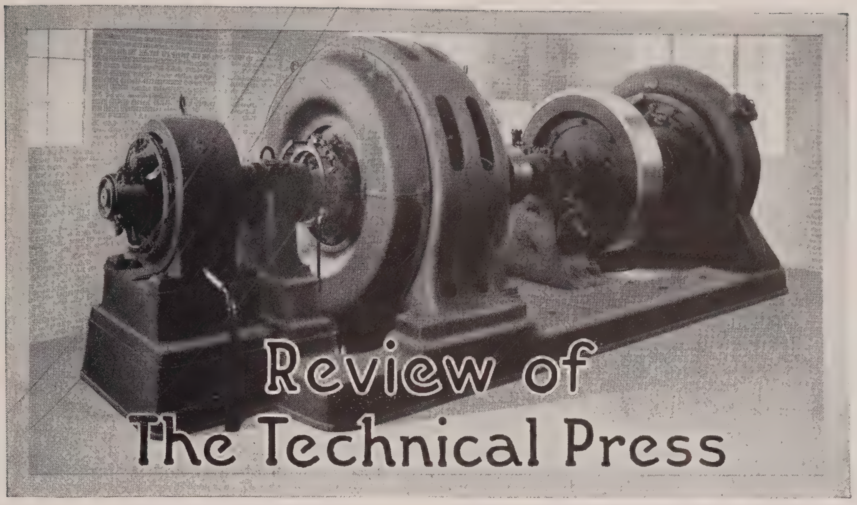
When he attained the age of fifteen years, Mr. Catton started his apprenticeship with the Lyons Electrical Company of Brantford. At that time the company did a large business and Mr. Catton did work for them in New Brunswick and other distant parts of Canada. The company specialized on private plants, installing a complete system including generators, switchboards, transformers and all wiring.

When he was twenty-two years of age, Mr. Catton installed a gas engine-driven electric light plant in opposition to the Dominion Power and Transmission Company in Brantford and operated this plant until his health gave way. He then went with the Canadian Machine Telephone Company and considers his experience there of great value. After about one year of telephone work, Mr. Catton went to California and secured a position with the Pacific Electric Company, gaining some valuable experience in Central Station work including large storage batteries and railway work.



W. R. Catton

In the latter end of 1910, Mr. Catton started with the Hydro Electric Power Commission in Woodstock. At that time it was a rather blue shift if power did not fail every time the wind blew over five miles per hour. New Year's day in 1911, he was put in charge of Stratford Station. Mr. Catton was the man who closed the High Tension Loop. In March, 1913, Mr. Catton was placed at the Brant Transformer Station, as inspector on Buildings and Apparatus, and when the building was completed and alive, he took a position as Superintendent of the Brantford Hydro-Electric System, which was in March, 1914, at which time the System was under the management of Mr. L. G. Ireland. Since the summer of 1916, Mr. Catton has had the responsibility.



By F. F. Espenschied

Successful Operation of Secondary Network

THE growing density of load on distribution systems, due to the greater use of devices and particularly electric stoves, necessitates more careful thought on secondary distribution systems. A timely article on this subject appears in the January 26th issue of the *Electrical World* and is written by Mr. S. Bingham Hood, superintendent of Distribution, Northern States Power Company, (Minn.). Mr. Hood was for a number of years an official of the Toronto Electric Light Company. Mr. Hood's article is particularly concerned with the banking of distribution transformers. He had pointed out that the effort to operate secondary alternating-current networks on the old direct current network principle has resulted in varying degrees of success. The majority of the failures, however, can be traced to a disregard of the underlying principles involved. In a secondary alternating network fed by several transformers of moderate rating each transformer becomes the equivalent of a direct current feeder, and the primary network the equivalent of a direct current sub-station bus.

Each individual transformer feeding the network must be protected on both the primary and secondary sides by fuses which will open in case of abnormal demands for current. Suitable primary fuses for this work are made by a number of companies. Secondary fuses for this service are not usually available except at unreasonable cost. Mr. Hood does not believe that enclosed fuses for this service are necessary owing to the small fire risk involved and suggests the use of exposed non-

corrodable metal links mounted in simple exposed metal clip terminals. The neutral wire of the secondary system must in all cases be permanently and effectively grounded and must be continuous without suses throughout its length, including the neutral lead of the transformer econdary winding.

Distributing transformers must be heavily fused on both primary and secondary sides, particularly when they feed into a network. Fuses rated at from two and one-half to three times full load current are none too heavy. Maximum loads on transformers should be determined by a system of periodic tests and a record of loads connected in the period between tests. Numerous momentary heavy demands on networks result in unnecessary interruptions to service if it is attempted to fuse too close to normal capacity of transformers.

In designing the secondary network a definite section is assumed to be supplied by each individual transformer which should be located at approximately the center of the load and feeding, is possible, in a number of directions. Transformers placed on junction poles are not advisable owing to the already complicated wiring at these points. Transformers should, however, be located as close as possible to junction poles. With such an arrangement a network is formed for parallel operation, but frequent failure is said to result from not giving proper consideration to other important matters. If one transformer in a network fails, its load must be taken up by the rest of the connected bank and since a transformer will safely carry a 50 per cent. overload for a short time, the minimum number of transformers which should be operated in parallel is fixed at three. The more transformers there are connected in parallel the smaller proportionate overload each will bear when one unit fails. It is also pointed out that all the units feeding into an interconnected network must be of the same rating to prevent the failure of a large transformer seriously overloading the smaller one adjacent thereto. This lack of uniformity in transformer sizes is said to be responsible for a large proportion of the failures on this type of construction. Using a standard size unit simplifies the stock to be carried. A growth in load can be taken care of by adding units and moving others where necessary.

In selecting the unit transformers for any district due regard should be given to the probable future development of the district to be served. In a rapidly growing district fairly large units are recommended from 15 to 25 K.V.A. in size. Moderately heavy secondary mains of considerable length will be necessary to economically load the units, but this is advisable at first since it will permit taking on additional load as the district developes, by adding transformers at intermediate points. This practice is recommended particularly where the electric cooking load is increasing. If the old practice is followed of installing small secondary mains and small transformer units, the cost of continually increasing their size as new load comes on will result in a heavy

expenditure and rapid depreciation of the investment.

The results can be obtained in network operation when the secondary mains are connected in a series of rings, each surrounding one or more blocks of the district served. This arrangement will prevent the serious overloading of any one transformer in the event of a single failure, but in practice a tail-end section on the network is sometimes found. In such a situation it is necessary in order to prevent placing a 100 per cent. overload on the next transformer, to see that the tail-end transformer is not normally loaded to more than 50 per cent. of its rating. Such tail-end section therefore, should be avoided where possible.

A ring type primary system is also recommended for feeding a secondary network. The usual practice of a primary feeder with numerous taps taken off to feed the various transformers will not give safe operation on an interconnected system, the reason being that a break at any point on the primary system within the network area will result in those transformers on the supply side of the break feeding the rest of the load beyond the break through the interconnected secondary. The result would be a general and wholesale blowout on the entire network. To avoid such a situation the primary system must be connected in a series of one or more closed rings. Not more than one transformer unit should be located at a single spur taken off this primary ring, which has the additional advantage of equalizing voltage and requiring a minimum amount of copper. Sections can also be cut out for repairs without interrupting service.

The primary ring main should be independent of the general primary feeder and connected without automatic cutouts throughout the section served. The primary ring should be controlled by an individual switch or cutout at the point where the primary section taps off the main feeder.

When a three-phase source of supply is used it is said to be good practice to divide the district served into sections, each fed from a single phase. Mr. Hood claims that in one large city where this sort of parallel operation has been in use for a number of years there has not been a single network interruption since the inception of this system. On the same system the failure of individual transformers from lightning and other causes has been remarkably reduced and are now of rare occurrence.

The operation of networks successfully depends somewhat on the education of the customers served. Poor service should be promptly reported and should receive immediate attention, since in most cases it will be due to troubles which can be readily remedied. It is recommended that a normal drop in voltage of not over 3 per cent. be maintained on good systems of secondary distribution. With transformers properly spaced the failure of any single unit will then result in a drop of about 12 per cent. in lamp voltage for a customer near the defective unit, resulting in a com-

plaint of poor light as soon as the evening peak comes on. Prompt attention by the troubleman will quickly locate and remedy the defect before other failures occur.

Heavy concentrated loads, such as those of apartment houses or large buildings in a ring main section should not be served from the network. Such loads should be connected direct to the primary system through individual transformers with connection to the nearest point of the interconnected network through fuses of small capacity. This will permit of emergency service to the large block from the ring main during period of light load. For such heavy loads, two transformers, one on each side of the three-wire service are recommended. The failure of one unit therefore, will blow the network connected fuses and deprive the customer of one-half his load.

The article also contains a sketch showing a typical secondary network arranged in accordance with the suggestions made.

Electric Range Performance

ELECTRIC cooking data somewhat out of the ordinary appears in the *Electrical Review* (Chicago) for March 30th. The information was taken from Bulletin No. 9 of the Kansas State Agricultural College and is based on results of actual tests carried on for one week on eight different makes of electric ranges installed in eight different families and all cooking the same things and the same number of meals per day. A daily menu was prepared and followed by all the eight householders. With slight exceptions the meals were cooked for two persons in each case. The results obtained were quite consistent, the total kilowatt hours for the week averaging 20.7.

Experiments were also conducted to throw light on the question of the relative amount of meat shrinkage in electric, gas, and coal ovens. From the results obtained the same size of meat roast when cooked under similar conditions in any of the three classes of ovens showed but little difference in shrinkage. In one set of tests the average shrinkage for roasts weighting around 3 pounds showed for the electric oven 31.35 per cent., for the gas oven 37.1 per cent. and for the coal oven 31.4 per cent. The results are not conclusive and only averages taken from a great number of tests would give reliable information on this point. Apparently enthusiastic stove salesmen have in many cases considerably overestimated the possible saving in meat shrinkage when cooked in the electric oven.

The table below shows the comparative cost of preparing the same menu schedule on coal, kerosene,

gas and electric stoves. The relative prices of electricity, coal, oil, and gas would of course vary from place to place.

Fuel	Rate	Quantity	Cost per Schedule week
Electricity	3c. per kw. hr.	20.7 kw. hr.	$0.62
Gas artificial	$1.00 per M. cu. ft.	320 cu. ft.	.32
Coal	$8.00 per ton	70.25 lbs.	.29
Kerosene	11c. gal	2 gals.	.22

The article is interesting in showing results of carefully conducted tests under proper working conditions.

Transformers at Strachan Ave. Station

THE Canadian General Electric Company is now completing, at Peterboro, an order for fifteen 5,000 kva., 25 cycle, 110,000 volt transformers for the Hydro-Electric Power Commission of Ontario. These transformers are for the Strachan Avenue Terminal Station of the Commission at Toronto, and nine of the fifteen units are already installed. When the installation is completed in a month or two, the Commission will have in this station a total transformer capacity of 75,000 kva., on the basis of 40° C. rating or approximately 100,000 kva., on the basis of maximum rating.

The Toronto Station was originally laid out for two banks of 1,250 kva. transformers with one spare unit. At a later date, the 1,250 kva. units were replaced by 2,500 kva. units, and later, the station was extended to accommodate three additional banks of 2,500 kva. transformers. Two of these banks were installed but, before the last bank was ordered, the decision was reached to again double the unit capacity. To accomplish this with the floor space limitations of the original transformer pockets, it was necessary to increase the height dimensions very materially and it is now 24 feet from the rails to the top of the high tension leads. This accounts for the slim appearance of the tank as shown in the accompanying cut. The floor space limitations also precluded the possibility of using core type construction in this case.

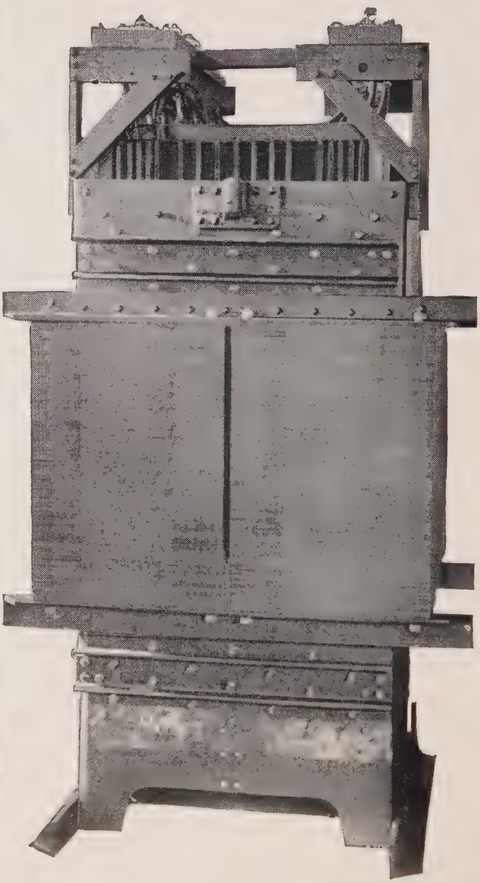
The transformers are shell type units with reinforced steel plate housing and supports. The economy in weight by this construction (standard with us) made it possible and safe to utilize the existing foundations without material change, in spite of the fact that the main weight of the transformer loading is carried over to the central foundation wall by a short cantilever construction.

The transformers have button type spacers between coils and the coil ends extending above and below

the core are firmly braced against distortion from short circuit strains. Particular attention is drawn to the appearance of the core in the accompanying cut showing the core and the coil housing. The cut, however, does not do justice to the good results which the Company is accomplishing in piling sheet steel laminations.

The tanks for these transformers, which, it will be noted, are without horizontal seams, were made at the Davenport Works, Canadian Allis Chalmers, Limited.

5,000 Kva., 110,000 Volt Transformer



Core and Coil Housing

Sales Notes

By J. F. S. MADDEN

DURING the next few weeks throughout the United States and Canada, a great harvest will be reaped. To prepare for this harvest a great deal of work has been done, National advertising by the appliance manufacturers, coupled with local campaigns, calculated to stimulate the seasonable demand for Irons, Fans and Cooking Appliances, which should insure a bumper crop of summer sales. In case you have not ordered sufficient Fans, remember that the Commission still has Fans in stock to meet the demand during the hot spell. This stock is limited, and municipalities should not delay ordering, if they have not already provided for their requirements.

During the summer season, there should be a ready sale for the Toaster Stove. This inexpensive appliance on which a frying pan and a tea pot can be used, and which toast can also be made, can be effectively demonstrated.

A rather unusual demand has been experienced recently for Immersion Type Heaters. Whether this is due to the unexpected increase in the birth rate or to fact that there is a tendency to economize by home saving, has not been determined.

Some appliance manufacturers are taking steps to avoid the serious difficulties which occurred last Fall on deliveries by increasing their stock limits, and are appealing to their customers to anticipate their requirements as far as possible. In the case of radiant heaters for example, the situation would be greatly improved, if the municipalities, where possible, would place orders at the present time for Fall delivery, or advise us as to their probable requirements.

Tungsten Lamps

The following extract from the Public Service Lumen, well illustrates the increase in the use of Tungsten lamps:

"The total sales of Tungsten filament lamps in the United States, excluding miniature lamps, for the year 1917, aggregated in round numbers, 165,000,000, an increase over the previous year of about 14 per cent. The total number of miniature lamps sold was 75,000,00, an increase of about 40 per cent. over the previous year. The relative importance of lamps having carbon filament, viz., the Carbon and Gem lamps, has decreased each year, so that at present it is about 12 per cent. of the total, whereas ten years ago it was 100 per cent. At that time practically no Gem or Tungsten filament lamps were sold."

Top Connected Meters

Orders are still received occasionally for top connected service meters. Apparently the reason for this is that such meters are required for services where top connected meters have been previously installed, and to avoid the necessity of changing the wiring to adapt it to bottom connected meters, the meter manufacturers have all adopted the bottom connected service meters as standard, doubtless realizing what a desirable thing it would be both from their own standpoint and that of the central station, to have a uniform practice adopted in this respect. This should ultimately result in a convenience to the central station, if they will co-operate to the extent of replacing the top connected meters by bottom connected, when possible. The top connected meter can still be furnished on special orders, but in most cases this entails an extra charge and delay in shipment.

Pegging Away

The loafers gather on the steps of Jones' Electric Store; there's dust on Jonesey's counter; there's junk on Jonesey's floor. There's a snag in Jonesey's system—that's as plain as A B C not a thing that's ever wanted is where it ought to be. Jim never cleans his windows—says it makes the light too strong; he never straightens out his stock—it takes too cussed long. Jim Jones abhors "fine fixin's," says he doesn't think they pay. "I'll git along," says Jim, "as long as I kin peg away." So Jim he pegs away at this and pegs away at that, sells Mrs. Binks an iron, or wires up a flat, takes an order for a washer, or sells an eight-inch fan. He pegs away at keeping store and does the best he can, but with all of Jim's persistence he doesn't get ahead—says business needs assistance, that the dad blamed town is dead. So he tinkers in his workshop, says he "hopes to make 'er pay," and "By Heck, I don't see why she won't—I always peg away." Jim could take a hundred hunches from the grocer up the street, who sells green stuff tied in bunches, who is bugs on being neat, who never mixes spuds and greens, or cabbages and peas, who keeps his records perfect, and collects his bills with ease, who knows the cash that each day brings, the profit on each sale, knows how to watch the little things and gather in the kale. That's why this man of corn and beans can joyride in his bus, while Jim, who ought to have the means, must peg away and cuss.—*Contact.*

HYDRO MUNICIPALITIES

NIAGARA SYSTEM

25 Cycles

	Pop.
Acton	1,735
Ailsa Craig	586
Ayr	800
Baden	710
Beachville	503
Blenheim	1,424
Bolton	727
Bothwell	703
Brampton	4,041
Brantford	25,420
Breslau	500
Brigden	400
Burford	700
Burgessville	300
Caledonia	1,217
Chatham	12,863
Clinton	2,177
Comber	800
Dashwood	350
Delaware	350
Dorchester	400
Dresden	1,521
Drumbo	400
Dublin	218
Dundas	4,652
Dutton	870
Elmire	2,270
Elora	1,115
Embro	483
Etobicoke Township	5,711
Exeter	1,572
Fergus	1,776
Forest	1,495
Galt	11,852
Georgetown	1,905
Goderich	4,655
Grantham Township	3,271
Granton	300
Guelph	16,735
Hagersville	1,105
Hamilton	100,461
Harriston	1,404
Hensall	749
Hespeler	2,740
Highgate	500
Ingersoll	5,176
Kitchener	19,266
Lambeth	350
Listowel	2,326
London	58,055
Lucan	662
Lynden	662
Milton	2,072
Milverton	893
Mimico	1,976
Mitchell	1,687
Mount Brydges	500
New Hamburg	1,543
New Toronto	1,186
Niagara Falls	11,147
Norwich	1,189
Oil Springs	599
Otterville	500
Palmerston	1,843
Paris	4,370
Petrolia	3,891
Plattsville	550
Point Edward	899
Port Credit	1,046
Port Dalhousie	1,318
Port Stanley	849
Preston	4,643
Princeton	600
Ridgetown	2,326
Rockwood	650
Rodney	655
Sandwich	3,077
Sarnia	11,676
Seaforth	1,964
Simcoe	4,061
Springfield	442
St Catharines	17,880
St. George	600
St. Jacobs	400
St. Mary's	3,958
St. Thomas	17,174
Stamford Township	3,418
Stratford	17,081
Strathroy	2,998
Streetsville	539
Tavistock	1,009
Thamesford	504
Thamesville	769
Thorndale	250
Tilbury	1,740
Tillsonburg	3,084
Toronto	463,705
Toronto Township	4,875
Vaughan Township	4,187
Walkerville	5,096
Wallaceburg	4,107
Waterdown	785
Waterford	1,133
Waterloo	4,956
Waterloo Township	6,693
Watford	1,221
Welland	7,243
West Lorne	724
Wellesley	583
Weston	2,156
Windsor	24,162
Woodbridge	639
Woodstock	10,084
Wyoming	544
Zurich	450
Total	993,862

SEVERN SYSTEM

60 Cycles

Barrie	6,453
Camp Borden	......
Coldwater	579
Collingwood	7,610
Creemore	585
Elmvale	775
Midland	6,258
Orillia	7,448
Penetang	3,928
Port McNichol	500
Stayner	972
Victoria Harbor	1,477
Waubaushene	600
Total	37,185

WASDELL'S SYSTEM

60 Cycles

Beaverton	1,015
Brechin	215
Cannington	903
Sunderland	570
Woodville	388
Total	3,091

ST. LAWRENCE SYSTEM

60 Cycles

Brockville	9,428
Chesterville	854
Prescott	2,740
Williamsburg	100
Winchester	1,065
Total	14,187

EUGENIA SYSTEM

60 Cycles

	Pop.
Alton	700
Artemesia Township	...
Arthur	1,041
Chatsworth	374
Chesley	1,975
Dundalk	721
Durham	1,600
Elmwood	500
Flesherton	428
Grand Valley	644
Hanover	3,221
Holstein	285
Horning's Mills	350
Markdale	989
Mount Forest	1,941
Orangeville	2,493
Owen Sound	11,910
Shelburne	1,115
Tara	590
Total	30,877

OTTAWA SYSTEM

60 Cycles

Ottawa	100,163

PORT ARTHUR SYSTEM

60 Cycles

Port Arthur	14,307

MUSKOKA SYSTEM

60 Cycles

Gravenhurst	1,702
Huntsville	2,395
Total	4,097

CENTRAL ONTARIO SYSTEM

60 Cycles

Belleville	12,277
Bowmanville	3,655
Brighton	1,337
Cobourg	4,712
Colborne	1,012
Deseronto	2,221
Kingston	21,325
Lindsay	7,481
Madoc	1,179
Millbrook	835
Napanee	2,926
Newburgh	486
Newcastle	611
Omemee	482
Orono	700
Oshawa	8,240
Peterboro	20,426
Port Hope	4,649
Stirling	732
Trenton	5,000
Tweed	1,364
Whitby	2,864
Total	104,514

NIPISSING SYSTEM

60 Cycles

Callander	650
Nipissing	400
North Bay	9,855
Powassan	575
Total	11,480

RIDEAU SYSTEM

60 Cycles

Perth	3,478
Smith's Falls	6,021
Total	9,499

THE aim of the Bulletin is to provide municipalities with a source of information regarding the activities of the Commission; to provide a medium through which matters of common interest may be discussed, and to promote a spirit of co-operation between Hydro Municipalities.